

EXHIBIT 4

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK

CARNEGIE INSTITUTION OF
WASHINGTON,

M7D CORPORATION

Plaintiffs,

v.

FENIX DIAMONDS LLC,

Defendant.

Civil Action No. 1:20-cv-00200-JSR

**EXPERT REPORT OF J. MICHAEL PINNEO, Ph.D., REGARDING INVALIDITY OF
U.S. PATENT NOS. RE41,189 AND 6,858,078**

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I, J. Michael Pinneo, Ph.D., if called to testify at trial, expect to testify as follows:

I. INTRODUCTION

1. My name is John Michael Pinneo. I am currently a managing member of RidgeDev LLC, a consulting company. At the request of Defendant Fenix Diamonds LLC (“Fenix Diamonds”), I have prepared the following expert report pursuant to Federal Rule of Civil Procedure 26(a)(2)(B) on its behalf in this litigation, which I understand was filed against them by Carnegie Institution of Washington (“Carnegie”) and M7D Corporation (“M7D” — collectively, “Plaintiffs”) as Civil Action No. 1:20-cv-00200-JSR in the Southern District of New York.

2. I have been retained by counsel for Fenix Diamonds to provide expert testimony in the above-captioned litigation.

3. I understand from counsel that Plaintiffs are alleging that Fenix Diamonds infringes claims 1, 6, 11, 12, and 16 of U.S. Patent No. 6,858,078 (“the ’078 patent”) along with claims 1 and 2 of U.S. Patent No. RE41,189 (“the ’189 patent”). I understand from counsel that Fenix Diamonds has counterclaimed for a declaratory judgment that claims 1, 6, 7, 11, and 16 of the ’078 patent and claims 1 and 2 of the ’189 patent are invalid (collectively, “the Asserted Claims”).

4. I have been asked by Fenix Diamonds to review the ’078 patent, the ’189 patent, and related prior art. Specifically, I have been retained as a technical expert by Fenix Diamonds to study and provide my opinions on the technology claimed in, and the patentability or unpatentability of, the Asserted Claims. In connection with this study, I have considered how one skilled in the art would have understood the disclosures of the prior art at the time of the invention to relate to the Asserted Claims of the ’078 patent and the ’189 patent.

5. In connection with my opinions, I expect that I may testify about background issues necessary to understand the technology at issue, and reserve the right to provide a detailed tutorial to the Court regarding the underlying technical analyses that underlie my opinions.

IX. INTRODUCTION TO SELECT PRIOR ART FOR THE '078 PATENT

105. The purpose of my analysis of the prior art with respect to the '078 patent is to demonstrate that to the extent that Plaintiffs' infringement theories are correct or applicable, then the prior art would anticipate and render obvious the Asserted Claims of the '078 patent.

106. To the extent that my analysis of the prior art departs from the Court's Claim Construction Order and how a POSA would understand the '078 patent, it is a result of applying Plaintiffs' infringement theories to evaluate how the prior art's disclosures would render the Asserted Claims of the '078 patent unpatentable.

107. I have been advised that the Plaintiffs contend that a diamond with any amount of polycrystalline growth qualifies as a single-crystal diamond because the polycrystalline domain can be removed before sale. Therefore, I assume that all prior art diamond with a single-crystal domain is "single-crystal diamond," no matter how much polycrystalline material the diamond includes.

108. I have been advised that the Plaintiffs contend that all high-quality diamonds are fabricated with sub-20°C thermal gradients. Therefore, I assume that all prior-art high-quality diamonds must have also been fabricated with sub-20°C thermal gradients.

109. I have been advised that the Plaintiffs contend that polycrystalline growth is not evidence of thermal gradients in excess of 20°C. Therefore, I assume the same in the prior art.

110. I have been advised that the Plaintiffs contend that it is possible to control "all temperature gradients to less than 20°C" without performing a temperature gradient measurement. Therefore, I assume the same in the prior art.

111. I have been advised that the Plaintiffs contend that a pyrometer is capable of measuring the maximum temperature gradient across a growth surface. Therefore, I assume that

vapor deposition, resulting in a non-uniform diamond. *Id.* at 1:68–2:14. To overcome this problem, Matsumoto discloses that a substrate temperature can “readily be controlled to a uniform temperature to obtain ... crystal-form diamond having uniform properties.” *Id.* at 2:10–13, *see also* Matsumoto at 6:7–13. Additionally, Matsumoto discloses growth rates of “a few micrometers per hour” of a diamond using plasma chemical vapor deposition. *Id.* at 1:42–43.

I. Saito (EP 0 879 904)

146. European Publication No. 0 879 904 (“Saito”) is a European Patent Application, entitled “Method and apparatus for producing single-crystalline diamond,” which names as inventors Hirohisa Saito, Takashi Tsuno, Takahiro Imai, and Yoshiaki Kumazawa. It has a filing date of April 17, 1998, and a publication date of November 25, 1998. I understand from counsel that Saito is prior art at least under 35 U.S.C. § 102(b) (pre-AIA) because it was publicly available more than one year prior to the effective filing date of the ’189 and ’078 patents.

147. Saito describes “a method of ... producing single-crystalline diamond.” Saito at 1:3–5. In particular, Saito describes that a “diamond is grown ... while maintaining ... the temperature of the prime base material” at 1050 ± 10 °C.” Saito at 9:28–34. Saito further discloses that “single-crystalline diamond can be stably grown on the surfaces of the base material for forming high-quality single crystalline diamond,” Saito at 2:49–51, and that while abnormal growth appears on the four corners of the base, “the diamond grows with no abnormal growth on extensions of the side surfaces.” Saito at 9:39–42.

X. ANTICIPATION AND OBVIOUSNESS OF THE ’078 PATENT

A. Assumptions

148. The purpose of my analysis of the prior art with respect to the ’078 patent is to demonstrate if Plaintiffs’ infringement theories were true, then the prior art would anticipate and render obvious the claims.

149. My analysis of the prior art for the '078 patent departs from the Court's Claim Construction Order and how a POSA would understand the '078 patent to the same extent as Plaintiffs' infringement theories.

150. The assumptions I have applied are discussed above in Section IX. Because Plaintiffs' infringement theories are erroneous, the assumptions I have made are erroneous. Therefore, my analysis in this Section is irrelevant to my positions on infringement, written description, enablement, definiteness, and patent eligibility.

151. It would be a misrepresentation to cite any of my prior art analysis for the purposes of proving infringement, sufficient written description, enablement, definiteness, or patent eligibility.

B. Secondary Considerations

152. I am not aware of any evidence demonstrating the existence of one or more of the "secondary considerations," such as commercial success, long felt but unsolved needs, or failure of others, that may serve as evidence of nonobviousness of any of the asserted claims of the '078 patent. It is my opinion that there was no long-felt but unmet need for the methods recited in the asserted claims of the '078 patent because the prior art already taught this subject matter or at the least rendered it obvious to one skilled in the art as discussed below. I reserve the right to amend or supplement my report as needed to address any evidence relied upon as constituting objective indicia of non-obviousness.

C. Under Plaintiffs' Erroneous Infringement Theories, Saito Anticipates the Asserted Claims

1. Claim 1

153. In my opinion, each of the limitations of claim 1 of the '078 patent is disclosed in Saito.

a POSA, both now and as of the effective filing date, has/had no ability to determine whether he or she is practicing the claims if the POSA measured thermal gradients under 20°C.

1227. This is because an infrared temperature sensor is incapable of determining the maximum or minimum temperatures on a growth surface. Vohra Dep. Tr. at 152:3–7 (“[a two-color pyrometer would] really [have] no way to find the maximal or minimal temperature.”).

1228. A multi-color pyrometer will report the rough (but not true) maximum temperature, but cannot find the minimum temperature. A one-color pyrometer can neither find the maximum nor the minimum temperature.

1229. For these reasons, in my opinion, after considering the specification of the '078 patent and the prosecution history related to it, determining whether “all temperature gradients across the growth surface are less than 20° C” as required in the Asserted Claims of the '078 patent remains to be technically unfeasible and a highly subjective inquiry. As such, in my opinion, the Asserted Claims of the '078 patent are indefinite for failing to include essential subject matter.

XIV. SUBJECT MATTER ELIGIBILITY OF THE '078 PATENT

1230. The asserted claims in the '078 patent recite a specific machine, namely a reactor configured for microwave plasma chemical vapor deposition. It is my understanding that the presence or absence of a specific machine is not dispositive for patent eligibility.

1231. For example, I understand that a claim directed to “a [torque-transmitting] shaft assembly of a driveline system” was recently found to be patent ineligible.

1232. I understand that the claim was found to be ineligible because the claim did not recite structure, beyond well-known mechanical equipment, for achieving its objective (tuning mechanical components of the driveline system based on Hooke’s law).

1233. In my opinion, the asserted claims are directed to a scientific principle, namely the edge effect. As discussed in the preceding sections, the edge effect is a scientific principle that occurs in microwave reactors in the same way that Hooke's law is a scientific principle that occurs in a shaft assembly of a driveline system.

1234. Both microwave reactors and driveline systems with shaft assemblies are man-made (i.e., artificial) structures.

1235. Under the edge effect, plasma chemistry intensifies as the corners and edges of a diamond growth surface, causing both polycrystalline growth and thermal gradients.

1236. The asserted claims recite the scientific principle of preventing the edge effect, namely thermal gradients under 20°C and insubstantial polycrystalline growth.

1237. According to Mr. Tsach, the claims are merely an instruction to “maintain[] even conditions” in a microwave reactor. Tsach Dep. Tr. at 314-15 (“The 20-degree threshold is an outcome. This is not – *maintaining even conditions is fundamental to the quality of the growth. When maintaining even conditions the 20 degrees C is a result.*”) (emphasis added).

1238. The scientific principle Mr. Tsach described was known in 1992. Tankala et al., Office of Naval Research, R&T Projection No. IRMT 034, Technical Report No. 4 (1992) at 2 (“a uniform surface temperature is crucial for the deposition of diamond films with uniform properties.”).

1239. I understand that patent eligibility is assessed via a two-step test. Step 1 queries whether the claims are directed to a scientific principle. If so, then step 2 queries whether the claims embody an inventive concept such that the claims contain an element or combination thereof that is sufficient to ensure that the patent amounts to significantly more than a patent upon the scientific principle.

XXI. CONCLUSION

1499. As described in detail above, it is my opinion that claims 1, 6, 7, 11, 12, and 16 of the '078 patent and claims 1 and 2 of the '189 patent are invalid as anticipated and as obvious because the limitations are fully taught by the prior art and one of ordinary skill in the art would have had reason with rational underpinning to combine the teachings of the prior art in the manner proposed with a reasonable expectation of success.

1500. It is also my opinion that claims 1, 6, 7, 11, 12, and 16 of the '078 patent and 1 and 2 of the '189 patent are invalid as failing to recite patent eligible subject matter.

1501. It is also my opinion that claims 1, 6, 7, 11, 12, and 16 of the '078 patent are invalid as lacking written description and/or enablement and indefiniteness regarding the claimed feature of “controlling temperature of a growth surface of the diamond such that all temperature gradients across the growth surface are less than 20° C.”

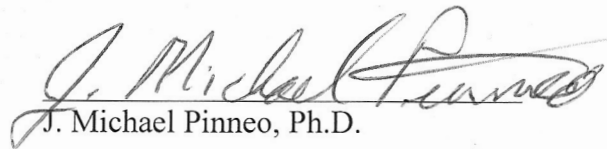
1502. It is also my opinion that claims 1 and 2 of the '189 patent are invalid as lacking written description and/or enablement regarding the claimed feature of “raising the CVD diamond to a set temperature of at least 1500° C. and a pressure of at least 4.0 GPA outside of the diamond stable phase.” It is also my opinion that 1 and 2 of the '189 patent are invalid for indefiniteness with respect to the term “outside of the diamond stable phase.”

1503. It is also my opinion that claim 2 of the '189 patent is invalid as failing to further limit claim 1 from which it depends.

1504. I expect to testify at trial regarding the matters discussed in this expert report and in any supplemental reports or declarations that I may prepare for this case. I may also testify at trial regarding my opinions and matters addressed by any expert or fact witness testifying on behalf of Plaintiffs, including but not limited to any reports, testimony, exhibits, and references of Plaintiffs' experts.

1505. I may also present a tutorial regarding the background technology and terminology relating to the opinions set forth in my reports. I may use demonstrative exhibits or refer to publicly available information, including technical publications such as books and articles, to aid my testimony at trial.

1506. I reserve the right to amend or supplement my report when additional information is made available to me. I may prepare additional exhibits or demonstrative evidence for trial pursuant to the schedule set by the Court.



J. Michael Pinneo, Ph.D.

September 18, 2020